Concerns about Ammonia Concentrations in Delta Waters

A June 2nd article in the Sacramento Bee highlighted some recent findings by Dr. Richard Dugdale, a researcher at San Francisco State University, which suggested that ammonia levels in the Delta and Sacramento River may pose a threat to Delta species by interrupting the food chain. The Regional Water Board and others agree that it is essential to initiate actions to follow-up on these preliminary results. Following is some background information and a brief description of the follow-up activities underway on this particular issue and some related issues.

Algal Production

Primary production rates and standing chlorophyll levels in the Sacramento-San Joaquin Delta Estuary are among the lowest of all the major estuaries in the world and continue to decline. The reason(s) are unclear but decreasing primary production is cited as a possible cause of the decline of important Delta fish species, such as Delta smelt. Recent work by Drs. Dugdale and Wilkerson, San Francisco State University Romberg Tiburon Center, has shown that elevated ammonium concentrations reduce diatom (a type of algae that is important in the Bay and Delta) production rates in water samples collected from San Francisco and Suisun Bays by inhibiting nitrate uptake. It is not known whether the same effect is manifested in the Delta.

Also, it is not known whether the ammonium concentrations in the River inhibit freshwater diatom production and are a cause of low algal primary production in the freshwater portions of the Delta. The Regional Water Board contracted with Dr. Dugdale to conduct experiments with diatoms collected from the lower Sacramento River to determine whether ambient in-stream ammonium concentrations reduce growth rates. Staff will be evaluating existing information to determine the need for studies to determine fate and transport of ammonium down the Sacramento River and across the Delta to determine what factors contribute to ammonium concentrations in Suisun Bay.

Once the results of the follow-up screening studies are complete, further work will be needed to determine the relative importance of ammonium on the Delta food web.

Delta Smelt Survival

In most water years, larval Delta smelt are caught in the spring about 30 miles below the City of Sacramento at the confluence of the Sacramento River and Sacramento Deepwater Ship Channel. Recent data from bioassay tests with ambient Sacramento River water has led to the hypothesis that larval Delta smelt may be sensitive to ammonia.

The Regional Water Board has contracted with researchers at the University of California, Davis to conduct bioassays with larval Delta smelt to determine their

sensitivity to ammonia in the lower Sacramento River and to identify whether other toxicants might be present. These studies were initiated in May 2008. Further study will be needed to determine if any additional actions should be taken to control ammonia discharges to protect Delta smelt.

Stimulation of Nuisance Algal Blooms

Recent research conducted by the Department of Water Resources (DWR) suggests that nuisance algal blooms that have been occurring in the Delta in recent years might be linked to elevated levels of ammonia in Delta waters. The nuisance blooms are characterized by surface scums and the release of toxins into the water. Regional Water Board staff is coordinating with DWR on follow-up studies.

Wastewater Treatment Plant Discharges

A recent review of ammonia concentrations in the Delta has shown that ammonia levels in the Sacramento River at Greene Landing are about an order of magnitude higher than concentrations reducing diatom growth in half in San Francisco Bay. And, as was discussed above, there are concerns about potential toxic impacts to Delta smelt and stimulation of nuisance algal blooms.

As was mentioned in the article, the Sacramento Regional County Sanitation District (SRCSD) discharge is the largest single source of ammonia in the Delta. Other sources include other smaller wastewater treatment plants and agricultural discharges. The Regional Water Board's current wastewater discharge permit requirements for ammonia are based on US EPA guidance on aquatic toxicity that is designed to protect the most sensitive aquatic species. When writing a permit, Regional Water Board staff evaluates effluent concentrations, concentrations of ammonia already in the river and available dilution. Limitations in permits are, therefore, site specific. SRCSD's permit allows for discharge of relatively high concentrations of ammonia because the river is large and provides considerable dilution. SRCSD has constructed large storage basins to hold wastewater when there is not sufficient dilution in the river. The City of Stockton, on the other hand, has very stringent effluent ammonia limits because little dilution is available. Several years ago the Regional Water Board required Stockton to upgrade their wastewater treatment facility to add treatment processes to remove ammonia.

It is important to recognize that current Delta ammonia concentrations are far lower than concentrations that US EPA guidance indicates would be toxic. The current studies and follow-up studies may provide information that would lead to the need for stricter requirements on all sources of ammonia to the Delta.

Be assured that the Water Quality Control Board is committed to protecting the waters of our state. In this effort we are engaged with the scientific community to study and document impacts to water quality. When new scientific information is developed we incorporate this information into our permits.